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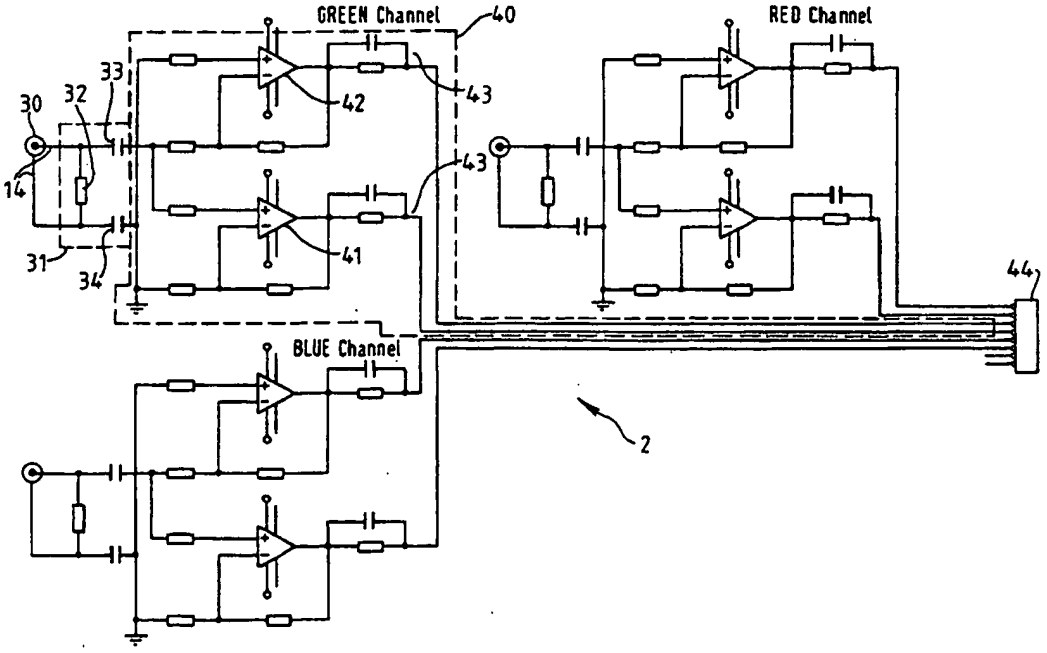
(54) Title: APPARATUS FOR TRANSMISSION OF VIDEO INFORMATION



(57) Abstract

An apparatus (2) for use in the transmission of a video information signal by twisted pair conductors (6), comprises input means (31) for matching the impedance of a video information signal source (4), driving means (40) for respective conductors of a twisted pair (6) including a pair of differential line drivers, one being an inverting amplifier (42) and another a non-inverting amplifier (41), each amplifier (41, 42) being fed with the signal from the signal source (4) output and means (43) for matching the impedance of the twisted pair conductors (6). Signals carried on the twisted pair conductors (6) are thereby balanced to promote immunity against inductive and/or capacitive interference.

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APPARATUS FOR TRANSMISSION OF VIDEO INFORMATION

The present invention relates to an apparatus for transmission and reception of video information by twisted pair conductors, particularly although not exclusively for RGB video information signals.

Conventionally video transmission is carried out over 75ohm coaxial cable for all video transmission signals, for example RGB, PAL, CCTV and composite. This impacts negatively on the ability to move the monitor to a new location or to add another, as more dedicated cables are required. This increases costs dramatically.

It is accordingly an object of the present invention to provide a novel apparatus for transmission and reception of video information over greater distances and with little or no deterioration in signal quality using twisted pair conductors whilst having advantages in, for example, cost and immunity to interference, over coaxial cables.

In broad concept, according to the present invention balanced inverted and non-inverted signals derived from an output signal from a generator, are transmitted through the conductors of a twisted pair thereby to promote immunity to inductive and/or capacitive crosstalk.

In further accordance with the present invention there is provided apparatus for use in the transmission of video information by twisted pair conductors, comprising:

input means for matching the impedance of a signal source;

driving means for respective conductors of a twisted pair including a pair of differential line drivers, one being an inverting amplifier and another a non-inverting amplifier, each amplifier being fed with the signal from the signal source;

output means for matching the impedance of the twisted pair conductors;

input means for matching the impedance of the twisted pair conductors;

driving means for an input of a signal receiver including a differential amplifier, each amplifier input being fed by a respective conductor of the twisted pair; and

output means for matching the impedance of the signal receiver, whereby the signals are balanced to promote immunity against inductive and/or capacitive interference.

Preferably the input impedance matching means of the signal source, and of the twisted pair conductors, further include AC coupling means. Conveniently the AC coupling means is provided by a pair of capacitors.

It is preferred that the driving means for the signal receiver includes means for frequency compensation of the video information. Conveniently this is provided by an adjustable filter.

It is further preferred that the adjustable filter is a capacitive network provided in parallel with the differential amplifier inputs.

In order to more fully understand the invention, a specific embodiment thereof will be described by way of example and with reference to the accompanying drawings in which:

Figure 1 is a block circuit diagram of a video line driver in accordance with the invention,

Figure 2 is a circuit diagram showing the transmitter circuit of the line driver of Figure 1, and

Figure 3 is a circuit diagram showing the receiver circuit of the line driver of Figure 1.

Referring to Figure 1 of the drawings, a video line driver 1 has a transmitter 2, and a receiver 3 connected by three 120 ohm twisted pair cables 5,6 and 7. A video signal source 4 such as a video tape deck is connected to three inputs 13,14 and 15 of the transmitter 2 via three 75 ohm coaxial cables 10,11 and 12 which carry, respectively, red, green and blue baseband signals. An RGB monitor 8 is connected to three outputs 16,17 and 18 of the receiver 3 by three 75 ohm coaxial cables 19,20,21.

In Figure 2 the circuitry relating to the green input to the transmitter 2 will be described, it being understood that the circuitry is identical for all three inputs. A BNC jack 30 provides the input connection 14 for a coaxial cable to an input stage 31. The input stage 31 has a resistor 32 to ensure that the impedance of the stage matches that of the cable 11 and a pair of coupling capacitors 33,34 to AC couple the circuit and so block DC from passing further along the signal path into a driver stage 40. The driver stage 40 contains a non inverting amplifier 41 and an inverting amplifier 42 both of which are fed with the signal from the input stage 31. The output of each amplifier 41,42 is connected to a matching circuit 43 which matches the amplifier output impedance of the twisted pair cable 6. The driver stage terminates in an RJ45 jack 44 to which the twisted pair cable 6 is attached.

Figure 3 shows the receiver 3. An input RJ45 jack 51 receives the three twisted pair cables 5,6 and 7.

Referring once more to the green signal, an input stage 50 has a resistor 52 to ensure that the impedance of the stage matches that of the twisted pair cable 6, and a pair of coupling capacitors 53,54 to block DC from passing further along the signal path into the driver stage 60. The driver stage provides selectable frequency compensation by way of capacitor networks 61,62 to the signals before they are passed into the inputs of a differential transformer 63. The output 17 from the amplifier is provided at an output BNC jack 64 having been matched to the characteristic impedance of the 75 ohm coaxial cable 20 by matching circuit 65. The signal is taken from the jack 64 and fed, via the coaxial cable 20 to the green input of the RGB monitor 8 where, in combination with the red and blue input, the video source is displayed.

It will be appreciated that in use, red, green and blue colour baseband signals from the video signal source 4, which could be a video tape deck, are supplied to the inputs 13,14 and 15 of the transmitter 2. Each colour signal is AC coupled, via capacitors 33,34, to the transmitter 2 to prevent earth-loops and to prevent DC components on the transmitter 2 output. It should be noted that an earth loop is disadvantageous as it can introduce hum bars on the final picture display whilst a DC component on the transmitter output will increase resistive energy losses in the cable matching components. The green colour signal, for example, is then supplied to the inputs of the non-inverting amplifier 41 and an inverting amplifier 42 to derive two signals of equal magnitude but opposing polarity. These two signals can then be fed to separate conductors of the twisted pair 6 as a balanced pair of voltages. By balancing the signals carried on the twisted pair, good immunity to capacitive crosstalk is obtained and the twisted pair, through its

reduced loop area, provides immunity to inductive crosstalk.

In order that a conventional RGB monitor 8 may be used, the signals carried on the twisted pair conductors must be supplied to a receiver for conversion to a signal capable of being used by a conventional RGB monitor 8. The receiver 3 is, for the reasons given above, AC coupled to the twisted pair and in addition contains circuitry 61,62 adjustable to compensate for the attenuation of high frequency components of the signals caused by the twisted pair conductors themselves. The signals from the twisted pair are then supplied to the inputs of the differential amplifier 63 which produces an output signal capable of being used by a conventional RGB monitor 8.

In tests, transmission distances of up to 100m using twisted pair cables have been obtained with no noticeable loss in picture quality owing to the good immunity of balanced twisted pair conductors to both capacitive and inductive interference.

CLAIMS:

1. An apparatus for use in the transmission of a video information signal by twisted pair conductors, comprising:

input means for matching the impedance of a video information signal source;

driving means for respective conductors of a twisted pair including a pair of differential line drivers, one being an inverting amplifier and another a non-inverting amplifier, each amplifier being fed with the signal from the signal source;

output means for matching the impedance of the twisted pair conductors; whereby the signals carried on the twisted pair conductors are balanced to promote immunity against inductive and/or capacitive interference.

2. An apparatus for use in the reception of a video information signal carried by twisted pair conductors, comprising:

input means for matching the impedance of the twisted pair conductors;

driving means for an input of a signal receiver including a differential amplifier, each amplifier input being fed by a respective conductor of the twisted pair carrying the video information signal; and

output means for matching the impedance of the signal receiver, whereby the signals carried on the twisted pair conductors are balanced to promote immunity against inductive and/or capacitive interference.

3. An apparatus as claimed in Claim 1 or Claim 2, wherein the input impedance matching means includes AC coupling means.

4. An apparatus as claimed in Claim 3, wherein the AC coupling means is provided by a pair of capacitors.

5. An apparatus as claimed in Claim 3 or Claim 4 as appendant to Claim 2, wherein the driving means for the signal receiver includes means for frequency compensation of the video information.

6. An apparatus as claimed in Claim 5, wherein the frequency compensation means is provided by an adjustable filter.

7. An apparatus as claimed in Claim 6, wherein the adjustable filter is a capacitive network provided in parallel with the differential amplifier inputs.

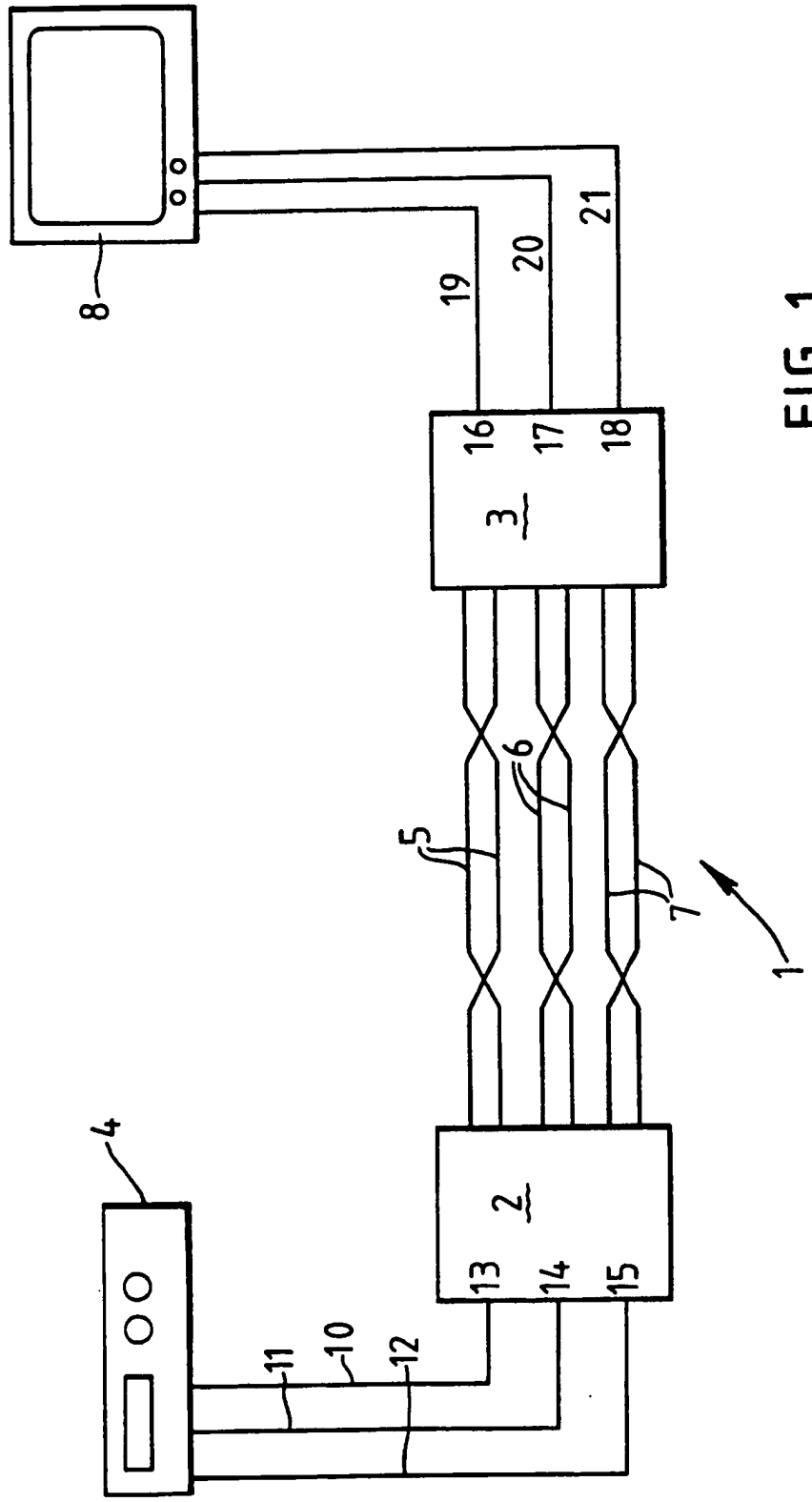

FIG. 1.

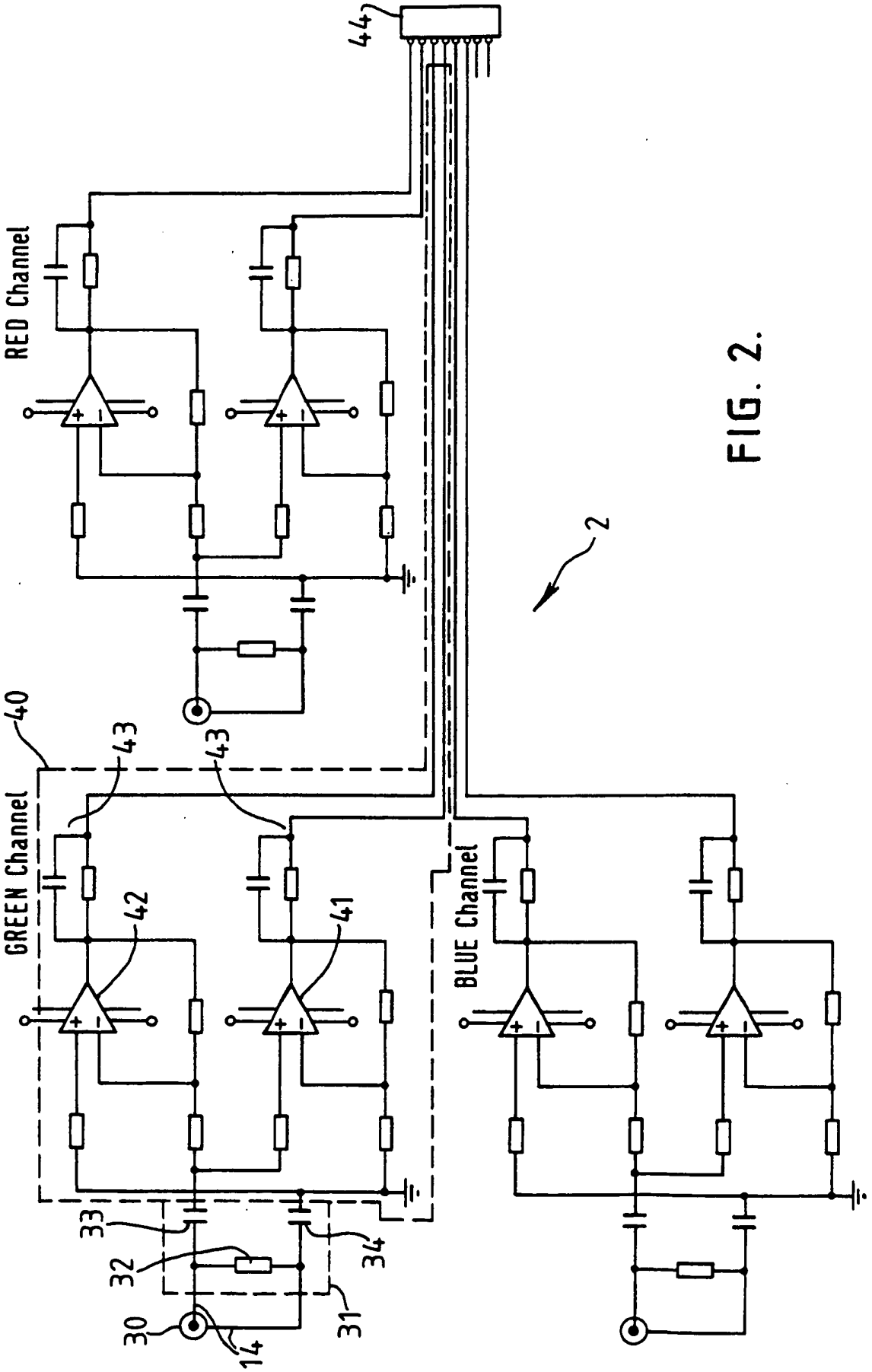
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FIG. 2.

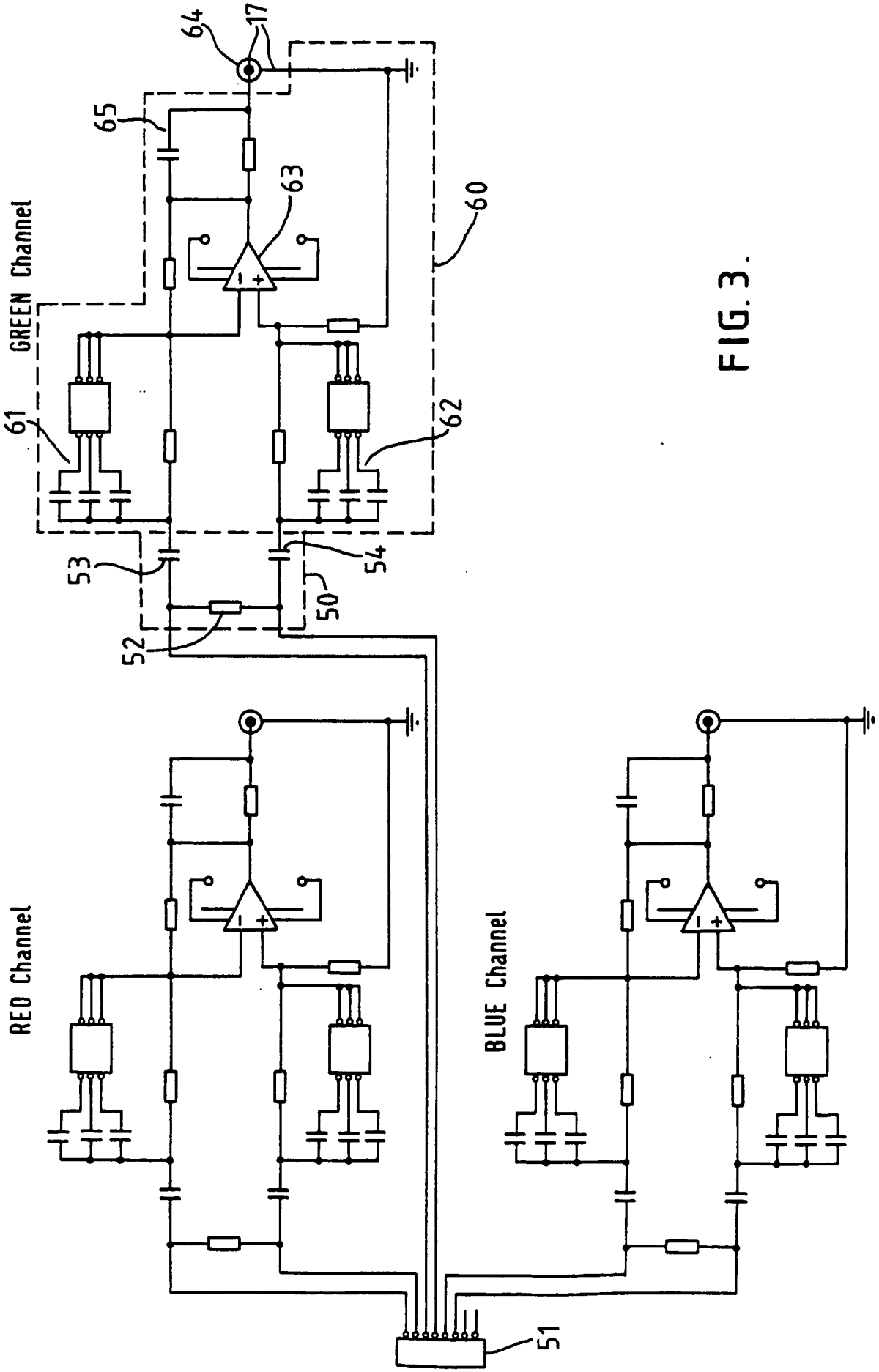
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FIG. 3.

A. CLASSIFICATION OF SUBJECT MATTER
IPC 5 H04N7/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 5 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,4 054 910 (CHOU ET AL.) 18 October 1977 see column 2, line 21 - column 6, line 26	1-7
A	PATENT ABSTRACTS OF JAPAN vol. 10, no. 224 (E-425) 5 August 1986 & JP,A,61 060 021 (FUJITSU) 27 March 1986 see abstract	1,2
A	INTERNATIONALE ELEKTRONISCHE RUNDSCHAU, vol.29, no.9, September 1975, BERLIN DE pages 185 - 190 BEEKMANN 'Die Übertragung von Videosignalen auf symmetrischen Leitungen' see figures	1,2

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO,A,93 04562 (AMULET ELECTRONICS) 4 March 1993 see page 1, line 1 - page 2, line 27; figure 10 -----	1,2

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US-A-4054910	18-10-77	NONE		
WO-A-9304562	04-03-93	AU-A-	2410792	16-03-93
		EP-A-	0598781	01-06-94
		GB-A-	2258778	17-02-93